WHAT IS CLAIMED IS:

1. A method for decoding a received word made of one of a Reed-Solomon code and an extended Reed-Solomon code having a certain number of error corrections as input data, the decoding method comprising:

a first error correction step of performing error correction for the input data using an error locator polynomial and an error evaluator polynomial derived based on the input data and syndromes of the number of error corrections, and setting the result of error correction as first corrected data;

a syndrome computation step of computing syndromes of the first corrected data; and

a second error correction step of performing error correction for the first corrected data based on the syndromes computed in the syndrome computation step, and setting the result of error correction as second corrected data.

2. The decoding method of Claim 1, further comprising:

an error number estimation step of estimating the number of errors generated in the input data based on the syndromes of the input data; and

an error number computation step of computing the number of errors using the error locator polynomial and the error evaluator polynomial derived based on the syndromes of the input data and the number of error corrections, wherein

in the first error correction step, the error correction is performed for the input data using the number of errors estimated in the error number

estimation step and the number of errors computed in the error number computation step.

3. The decoding method of Claim 2, wherein

the first error correction step comprises:

an error number determination step of determining whether a first determination condition that the estimated number of errors is equal to the computed number of errors and that both the estimated number of errors and the computed number of errors are equal to or smaller than the number of error corrections is true;

an error correction step of performing the error correction for the input data to obtain error corrected data, and obtaining error corrected data on an extended component based on the error corrected data;

a step of setting the error corrected data obtained in the error correction step as the first corrected data when it is determined in the error number determination step that the first determination condition is true and it is determined that one of the syndromes of the input data is not zero; and

a step of setting the input data as the first corrected data when it is determined in the error number determination step that the first determination condition is false and it is determined that all the syndromes of the input data are zero.

4. The decoding method of Claim 2, wherein

in the second error correction step, the error correction is performed for the first corrected data based on the syndromes of the first corrected data,

the estimated number of errors, and the computed number of errors.

5. The decoding method of Claim 3, further comprising

a step of determining whether a second determination condition that all the syndromes of the first corrected data are zero or that it is determined in the error number determination step that the first determination condition is false is true, wherein

in the second error correction step, when the second determination condition is true, the first corrected data is set as the second corrected data, and when the second determination condition is false, the input data is restored and set as the second corrected data.

6. The decoding method of Claim 2, wherein

the error number estimation step comprises:

a first step of determining whether all the syndromes of the input data are zero;

a second step of estimating that the input data has no error when all the syndromes of the input data syndromes are zero;

a third step of computing first, second, third and fourth error number estimation equations so as to estimate the number of errors in an unextended component in the input data when one of the syndromes of the input data is not zero;

a fourth step of determining whether all values of the first, second and third error number estimation equations are zero;

a fifth step of determining whether an extended component of the

syndromes of the input data is zero when it is determined in the fourth step that all the values of the first, second and third error number estimation equations are zero;

a sixth step of estimating that the number of errors is equal to a value obtained by subtracting two from the number of error corrections when it is determined in the fifth step that the extended component of the syndromes of the input data is zero;

a seventh step of estimating that the number of errors is equal to a value obtained by subtracting one from the number of error corrections when it is determined in the fifth step that the extended component of the syndromes of the input data is not zero;

an eighth step of determining that a value of the fourth error number estimation equation is zero when it is determined in the fourth step that one of the values of the first, second and third error number estimation equations is not zero;

a ninth step of determining whether the extended component of the syndromes of the input data is zero when it is determined in the eighth step that the value of the fourth error number estimation equation is zero;

a tenth step of estimating that the number of errors is equal to the value obtained by subtracting one from the number of error corrections when it is determined in the ninth step that the extended component of the syndromes of the input data is zero;

an eleventh step of estimating that the number of errors is equal to the number of error corrections when it is determined in the ninth step that the extended component of the syndromes of the input data is not zero;

a twelfth step of determining whether the extended component of the syndromes of the input data is zero when it is determined in the eighth step that the value of the fourth error number estimation equation is not zero;

a thirteenth step of estimating that the number of errors is equal to the number of error corrections when it is determined in the twelfth step that the extended component of the syndromes of the input data is zero; and

a fourteenth step of estimating that the number of errors is equal to a value obtained by adding one to the number of error corrections when it is determined in the twelfth step that the extended component of the syndromes of the input data is not zero.

7. The decoding method of any of Claims 1 to 6, wherein the number of error corrections is three.

8. A device for decoding a received word made of one of a Reed-Solomon code and an extended Reed-Solomon code having a certain number of error corrections as input data, the decoding device comprising:

a syndrome computation section for obtaining syndromes of the input data as input data syndromes, outputting a first flag signal that indicates whether the input data has an error based on the input data syndromes, obtaining syndromes of first corrected data obtained based on the input data and the input data syndromes as corrected data syndromes, and outputting a second flag signal that indicates whether the first corrected data has an error based on the corrected data syndromes;

an error number estimation section for estimating the number of

errors generated in the input data based on the input data syndromes computed by the syndrome computation section;

an evaluator/locator polynomial deriving section for obtaining coefficients at each order of an error evaluator polynomial and an error locator polynomial based on the input data syndromes, and obtaining error magnitudes based on error evaluation values and corresponding error locator polynomial differential values both obtained from the coefficients;

a Chien search section for obtaining roots of the error locator polynomial based on the coefficients, and computing the error evaluation values by substituting the roots in the error evaluator polynomial and the error locator polynomial differential values by substituting the roots in a derivative of the error locator polynomial;

an error number computation section for computing the number of errors based on the input data, the roots and the error magnitudes; and

an error correction section for performing error correction for the input data to obtain error corrected data based on the input data, the roots and the corresponding error magnitudes, wherein

the error correction section outputs the error corrected data as the first corrected data when the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section, both the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error corrections, and the first flag signal indicates that the input data has an error,

the error correction section outputs the input data as the first corrected data when the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section, one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error corrections, or the first flag signal indicates that the input data has no error,

the error correction section outputs data, obtained by performing restoration for the first corrected data for restoring the first corrected data to the input data, as the second corrected data when the second flag signal indicates that the first corrected data has an error, the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section, and both the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error corrections, and

the error correction section outputs the first corrected data as the second corrected data when the second flag signal indicates that the first corrected data has no error, the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section, or one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error correction.

9. The decoding device of Claim 8, wherein

the syndrome computation section comprises:

a selector for receiving the input data and the first corrected data that is output from the error correction section, and sequentially selecting and outputting the received input data and the received first corrected data;

a syndrome operator for obtaining the input data syndromes based on the input data output from the selector, and the corrected data syndromes based on the first corrected data;

an input data syndrome holder for holding and outputting the input data syndromes;

a corrected data syndrome holder for holding and outputting the corrected data syndromes;

a first zero syndrome detector for outputting the first flag signal so as to indicate that the input data has no error when all the input data syndromes output from the input data syndrome holder are zero, and outputting the first flag signal so as to indicate that the input data has an error when one of the input data syndromes output from the input data syndrome holder is not zero; and

a second zero syndrome detector for outputting the second flag signal so as to indicate that the first corrected data has no error when all the corrected data syndromes output from the corrected data syndrome holder are zero, and outputting the second flag signal so as to indicate that the first corrected data has an error when one of the corrected data syndromes output from the corrected data syndrome holder is not zero.

10. The decoding device of Claim 9, wherein

the syndrome operator comprises:

an unextended component syndrome processor for obtaining the input data syndromes and the corrected data syndromes of an unextended component based on the input data and the first corrected data sequentially output from the selector;

an extended component syndrome processor for obtaining the input data syndromes and the corrected data syndromes of an extended component based on the input data and the first corrected data sequentially output from selector; and

a bus driver for batch-outputting the input data syndromes of the unextended component output from the unextended component syndrome processor and the input data syndromes of the extended component output from the extended component syndrome processor, and batch-outputting the corrected data syndromes of the unextended component output from the unextended component syndrome processor and the corrected data syndromes of the extended component output from the extended component syndrome processor.

11. The decoding device of Claim 8, wherein

the error correction section comprises:

a comparison section for comparing the number of errors estimated by the error number estimation section with the number of errors computed by the error number computation section;

a first error corrector for outputting the first corrected data, an error

location, an error magnitude and the number of errors;

an error location data holder for holding and outputting the error location;

an error magnitude data holder for holding and outputting the error magnitude; and

a second error corrector for outputting the second corrected data, wherein

the comparison section outputs a third flag signal that indicates whether the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section and whether both the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error corrections,

the first error corrector performs error correction for the input data by subtracting or adding corresponding the error magnitude from or to a symbol indicated by the error location corresponding to the respective roots to obtain error corrected data, and obtains error corrected data on an extended component based on the error corrected data to set the obtained pieces of error corrected data as error corrected data,

the first error corrector outputs the error corrected data as the first corrected data when the third flag signal indicates that the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section and that both the number of errors estimated by the error number estimation section and the

number of errors computed by the error number computation section are equal to or less than the number of error corrections, and the first flag signal indicates that the input data has an error,

the first error corrector outputs the input data as the first corrected data when the third flag signal indicates that the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section or that one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error corrections, or the first flag signal indicates that the input data has no error,

the second error corrector performs restoration for the first corrected data for restoring the first corrected data to the input data by adding or subtracting the error magnitude corresponding to the symbol indicated by the error location to or from the first corrected data and outputting the obtained data as the second corrected data when the second flag signal indicates that the first corrected data has an error, and the third flag signal indicates that the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section and that both the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error corrections, and

the second error corrector outputs the first corrected data as the second corrected data when the second flag signal indicates that the first

corrected data has no error, or the third flag signal indicates that the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section or that one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error corrections.

12. The decoding device of Claim 11, wherein

the first error corrector comprises:

an error correction processor for outputting the first corrected data;

an extended component error correction processor for outputting the first corrected data on an extended component as well as the error location, the error magnitude and the number of errors for the extended component; and

a bus driver for batch-outputting the first corrected data and the first corrected data on the extended component as the first corrected data, wherein

the error correction processor performs error correction for the input data by subtracting or adding corresponding the error magnitude from or to the symbol indicated by the error location corresponding to the respective roots to obtain error corrected data,

the error correction processor outputs the error corrected data as the first corrected data when the third flag indicates that the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section and that both the

number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error correction, and the first flag signal indicates that the input data has an error,

the error correction processor outputs the input data as the first corrected data when the third flag indicates that the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section or that one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error correction, or the first flag signal indicates that the input data has no error,

the extended component error correction processor obtains the error corrected data on the extended component based on the error corrected data, and obtains the number of errors in the extended component,

the extended component error correction processor outputs the error corrected data on the extended component as the first corrected data on the extended component when the third flag indicates that the number of errors estimated by the error number estimation section is equal to the number of errors computed by the error number computation section and that both the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section are equal to or less than the number of error corrections, and the first flag signal indicates that the input data has an error, and

the extended component error correction processor outputs the input

data on the extended component as the first corrected data on the extended component when the third flag indicates that the number of errors estimated by the error number estimation section is not equal to the number of errors computed by the error number computation section or that one of the number of errors estimated by the error number estimation section and the number of errors computed by the error number computation section is greater than the number of error corrections, or the first flag signal indicates that the input data has no error.

13. The decoding device of Claim 8, further comprising:

a data storage section for holding and outputting the input data until the error correction section starts obtaining the first corrected data, and holding and outputting the first corrected data until the error correction section starts obtaining the second corrected data.

14. The decoding device of any of Claims 8 to 13, wherein the number of error corrections is three.